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Version No.			
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Answer Sheet No._____

Sign. of Candidate _____

Sign. of Invigilator _____

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

PHYSICS HSSC–II

SECTION – A (Marks 17)

Time allowed: 25 Minutes

حصہ اوّل لازمی ہے۔ اس کے جوابات اسی صفحہ پر دیے گئے نظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

Fill the relevant bubble against each question:

ہر سوال کے سامنے دیے گئے درست دائرہ کو پُر کریں۔

1.	A point charge $+q$ is placed at the centre of a cube of side 'a'. The electric flux emerging from the cube is:	○ *Zero*	○ $\frac{q}{\varepsilon_o}$	○ $\frac{q}{6\varepsilon_o}$	○ $\frac{q}{\varepsilon_o a^2}$
2.	The energy of an electron which accelerates through a potential difference of 1000 V is:	○ $1.6\times10^{-22}J$	○ $1.6\times10^{-20}J$	○ $1.6\times10^{-19}J$	○ $1.6\times10^{-16}J$
3.	A wire of uniform cross-sectional area 'A' and length 'L' is cut into two equal parts. The resistance of each part becomes.	○ Double	○ Half	○ Four time	○ Eight time
4.	The maximum output power is delivered to a load resistance 'R', when the internal resistance 'r' of the source is equal to:	○ ∞	○ 0	○ R	○ $\frac{R}{2}$
5.	The unit of magnetic flux density is:	○ $Wb.m^2$	○ $Wb.m^{-2}$	○ NAm^{-1}	○ NmA^{-1}
6.	Work done on a charged particle moving in a uniform magnetic field is:	○ Minimum	○ Maximum	○ Zero	○ Negative
7.	When carrying electricity on long distances, step-up transformers are used to:	○ Increase voltage, reduce current	○ Increase current, reduce voltage	○ Increase both voltage and current	○ Increase both voltage and power
8.	The capacitive reactance in a pure capacitive D.C circuit is:	○ Very small	○ Very large	○ Zero	○ Infinite
9.	An electromagnetic wave is generated by:	○ Any moving charge	○ Any accelerating charge	○ A charge with changing acceleration	○ A charge moving in a circle
10.	If both the length and radius of the rod are doubled, then modulus of elasticity will:	○ Increase	○ Decrease	○ Remains the same	○ Be doubled

11. The knee voltage for Germanium is:	◯ 0.3V	◯ 0.5V	◯ 0.7V	◯ 1.1V
12. In transistor, the emitter current, I_E is $3.5A$ and collector current, I_C is $2.35A$. What will be the base current?	◯ 5.85A	◯ 1.15A	◯ 1.48A	◯ 0.67A
13. Which particle has the shortest wavelength, if all are having the same velocity?	◯ Electron	◯ Proton	◯ Neutron	◯ $\alpha-$ particle
14. If an object moves with speed of light, its mass will be:	◯ Zero	◯ Maximum	◯ Infinity	◯ Minimum
15. The energy of the electron in the excited state $n=3$ in hydrogen atom is:	◯ –13.6eV	◯ –1.15eV	◯ –3.40eV	◯ –0.54eV
16. The process of generating three dimensional image of the object using laser beam is called:	◯ Holography	◯ Tomography	◯ Scanning	◯ 3-D Cinema
17. Mass equivalent of 931 MeV energy is:	◯ $1.66\times10^{-27}kg$	◯ $6.02\times10^{-27}Kg$	◯ $6.02\times10^{-23}Kg$	◯ $2.67\times10^{-27}kg$

Important formulae

- $I=\dfrac{\varepsilon}{R+r}$
- $\phi=\vec{E}.\vec{A}$
- $X_C=\dfrac{2}{2\pi fC}=\dfrac{1}{\omega C}$
- $R=\rho\dfrac{L}{A}$
- $I_E=I_B+I_C$
- $V=IR$
- $Elastic\ Modulus=\dfrac{Stress}{Strain}$
- $\lambda=\dfrac{h}{mv}$
- $E_n=-\dfrac{E_o}{n^2}$
- $e=1.602\times10^{-19}C$
- $1eV=1.602\times10^{-19}J$
- $E_o=13.6eV$
- $P=VI\cos\phi$
- $\Delta(KE)=q\Delta V$

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PHYSICS HSSC–II

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Time allowed: 2:35 Hours **Total Marks Sections B and C: 68**

NOTE: **Answer any fourteen parts from Section 'B' and any two questions from Section 'C'. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly. Statistical table will be provided on demand.**

SECTION – B (Marks 42)

Q. 2 Attempt any FOURTEEN parts. All parts carry equal marks. **(14 x 3 = 42)**

(i) Explain why the capacitance of a parallel plate capacitor increases when a dielectric slab is placed between its plates?

(ii) Is E necessarily zero inside a charged rubber balloon, if balloon is spherical? Assume that charge is distributed uniformly over the surface.

(iii) Why the e.m.f of a cell is always greater than its terminal voltage?

(iv) What is Wheatstone bridge? Deduce the condition for which Wheatstone bridge is balanced?

(v) How can one sperate particles of different velocities moving in a magnetic field?

(vi) A copper wire of diameter 1.6 mm carries a current of 20A. Find maximum magnitude of magnetic field due to this current.

(vii) How are eddy current produced in an iron core of transformer and how can they be minimized?

(viii) An induced e.m.f has no direction of its own. Explain breifly.

(ix) When an A.C source is connected to an ideal inductor, show that the average power supplied by the source over a complete cycle is zero.

(x) What is the basic principle of generation of electromagnetic waves?

(xi) Briefly explain the working principle of magnetic levitation train.

(xii) Why charge carriers are not present in the depletion region?

(xiii) How a PN-Junction diode is used as a full-wave rectifier?

(xiv) What is a transistor? Discuss the operation of NPN transistor.

(xv) What is meant by wave-particle duality? Explain on the basis of de-Broglie hypothesis.

(xvi) Calculate the shortest and longest wavelength of radiation for the Brackett Series.

(xvii) How can the spectrum of hydrogen contain so many lines even though a hydrogen atom has only a single electron?

(xviii) Describe the construction and working of Helium-Neon Laser.

(xix) The mass of $^{14}_{7}N$ nucleus is $13.999234u$. Calculate its binding energy. Given that Mass of Proton $= 1.007276u$ and Mass of Neutron $= 1.008665u$.

(xx) How can energy be released in the nuclear fusion process?

SECTION – C (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. **(2 x 13 = 26)**

Q. 3 **a.** State the principle of A.C generator. Explain by sketching graph, how is an A.C generator used to produce an alternating current? **(05)**

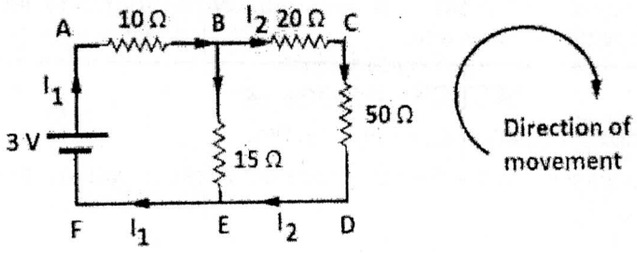
b. A current carrying loop is placed in a magnetic field. Derive an expression for the torque acting on it. **(04)**

c. Describe hysteresis loop for a magnetic material by drawing its curve for iron. **(04)**

Q. 4 **a.** Derive a relation for an impedance and resonant frequency in R.L.C series A.C circuit. **(05)**

b. State Gauss's law for electrostatics. Using Gauss's Law, derive a relation for the electric field intensity at a point due to a uniformly charged infinite plane sheet. **(04)**

c. Calculate the current in each branch of the circuit using Kirchoff's voltage law. **(04)**



Q. 5 **a.** What is a nuclear reactor? Give the principle, construction and working of a typical nuclear reactor. **(07)**

b. State the postulates of special theory of relativity. Discuss time dilation and length contraction as a consequence of special theory of relativity. **(06)**

Important formulae

- $E = \frac{kq}{r^2}$
- $\phi = \vec{E}.\vec{A}$
- $\Sigma V = 0 \rightarrow \Sigma IR = 0$
- $\varepsilon = N\frac{\Delta\phi}{\Delta t}$
- $P = VI$
- $V = IR$
- $V = V_m \cos\omega t$
- $Z = \sqrt{R^2 + (X_L - X_C)^2}$
- $P = VI\cos\phi$
- $I_E = I_B + I_C$
- $\lambda = \frac{h}{P} = \frac{h}{mv}$
- $\frac{1}{\lambda} = R_h\left(\frac{1}{P^2} - \frac{1}{n^2}\right)$
- $B.E(in\,MeV) = 931 \times \Delta m$
- $\Delta m = Zm_p + (A - Z)m_n - M_{(A,Z)}$
- $m_e = 9.109 \times 10^{-31} kg$ $= 5.485 \times 10^{-4} \mu$
- $k = 9 \times 10^9 Nm^2C^{-2}$
- $\mu_o = 4\pi \times 10^{-7} WbA^{-1}m^{-1}$
- $R_h = 1.0973732 \times 10^7 m^{-1}$
- $c = 3 \times 10^8 m/s$
- $m_p = 1.673 \times 10^{-27} kg$ $= 1.007u = 937MeV$
- $m_n = 1.675 \times 10^{-27} kg$ $= 1.008u = 938MeV$
- $e = 1.602 \times 10^{-19} C$
- $C_{med} = \frac{\varepsilon_o \varepsilon_r A}{d}$
- $E = \frac{V}{d} = \frac{Q}{\varepsilon_o A}$
- $F_m = qvB$
- $F_e = qE$
- $\varepsilon = IR + Ir$
- $B = \frac{\mu_o I}{2\pi r}$
- $F = NBIL$
- $\tau = Fl$
- $\sigma = \frac{Q}{A}$